NASA SBIR/STTR Technologies

T1.02-9940 - An Electrochemical, Point-of-Care Detector for Reagent-free, In-situ Diagnostics of Pathogens

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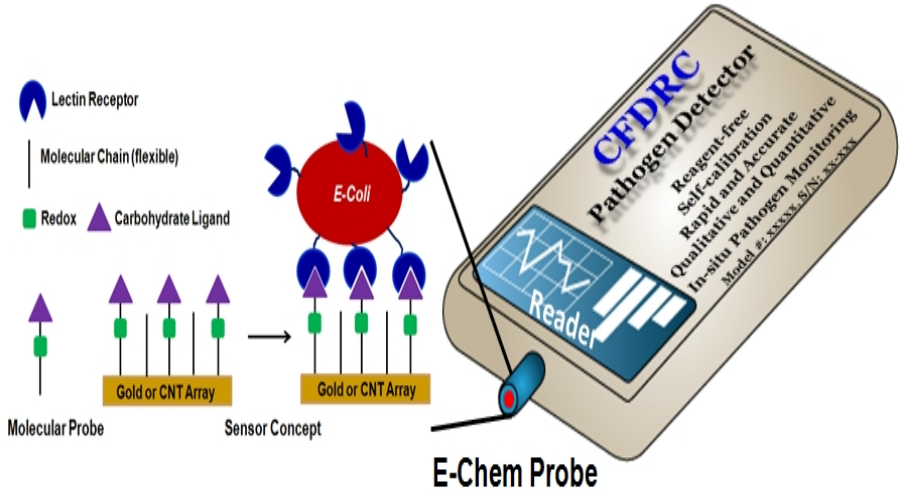
Identification and Significance of Innovation

Monitoring and understanding the risk of infectious diseases is crucial to ensure crew health, safety and performance on long duration space missions. There will be a critical need for in-situ diagnosis and assessment of disease pathogens from biological specimens of symptomatic astronauts and microbial contaminants of space environments. To meet the need, the proposed technology will provide a hand-held, non-cell-culture-based, point-of-care pathogen detector for reagent-free, in-situ monitoring of whole pathogenic bacteria. The core of the technology is based on a novel electrochemical probe rendering significantly enhanced specific affinity to target pathogen and a highly effective signal transduction of the specific pathogen binding reaction, which offers high compatibility to prevalent portable electrochemical device (e.g. glucose meter), and may be integrated as a module in PDA-based smart phone for wireless communication.



Estimated TRL at beginning and end of contract: (Begin: 1 End: 3)

Technical Objectives and Work Plan

Our Phase I goal is to demonstrate proof-of-concept of the proposed electrochemical detector probe, and the effort will focus on the synthesis of electro-active molecule, the preparation of electrochemical electrode and detection of a pathogen. Specific Phase I technical objectives and plan are:
? Design and synthesis of functional electro-active molecules that are ready to attach recognition moieties for cell
? Construction and characterization electrodes as probe for a selected pathogen: the electrochemical activity and signal transduction of the probe will be identified.
? Electro-active probe evaluation and demonstration of E-Coli detection: we will evaluate the specificity and affinity of the binding reaction, and finally demonstrate benchmark in-vitro detection of the E-coli
The molecular synthesis and structural characterization will be performed at the laboratory of the collaboration research institute. The electro-active electrode construction and testing, and the following probe evaluation, demonstration for pathogen detection will be performed at CFDRC's Biomedical Laboratory. At the end of Phase I, a report with data summary, technical review and plan for optimization of the probe will be provided. In Phase II, we will focus on improving and optimizing the pathogen probe, integration and engineering of a compact detector that is compatible to existing portable electrochemical instrument for both terrestrial and microgravity environments evaluation.

NASA Applications

The end product of the proposed STTR effort will be a first-of-kind, compact, low-cost, integrated disease pathogen analysis device. NASA will have a handheld, easy-to-use pathogen detector that can be easily integrated with existing astrobiological instrumentation or emerging smart biomedical system to keep track of astronaut health and space environment during planetary exploration. The same device can be adapted and used in other applications such as, life discovery on other planets, pharmaco

Non-NASA Applications

The proposed technology will provide a new type of electrochemical senor or diagnostic technology for no-cell-culturing-based pathogen detection for a variety of applications in healthcare, life sciences, hospital and health site monitoring of low level pathogens. It can also find use in drug discovery and the study of human diseases, clinical and preclinical diagnosis, and in the areas of cellula

Firm Contacts

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